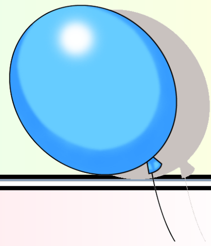
(6) M - Draw vector triangles using real data
(7) S - Apply a practical means to resolve forces
(8) C - Consider how to minimize uncertainty in an experiment.

Lesson 5. Resolving vectors practical

STARTER: Try Q4 from the sheet. (resolving vector follow up)



Kilo 10^3
Mega 10^6
Giga 10^9

Try the exam question Q5

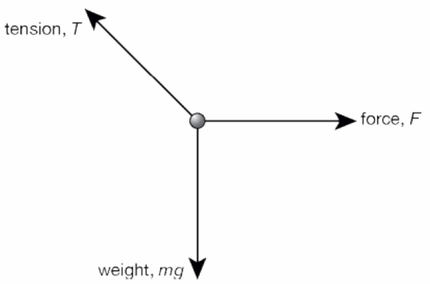
A parent is pushing their child on a swing. They stop the child momentarily by pulling on the swing seat with a horizontal force. The swing makes an angle of 40° to the vertical. The child and swing seat have a mass of 25 kg.

a Draw a free-body diagram of the forces acting on the child. *(3 marks)*

b Determine the tension in the swing. *(2 marks)*

c Find the force, F, with which the parent is holding the swing. *(2 marks)*

4 a Award a maximum of *3 marks*, *1 mark* for each correctly labelled force.



Allow: $m\,g$ **or** W for weight.

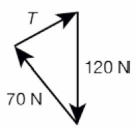
b $T\cos 40 = m\,g$ *(1 mark*

$T = \dfrac{m\,g}{\cos 40} = 320\,\text{N}$ *(1 mark*

c $F = T\sin 40$ *(1 mark*

$F = 205\,\text{N}$ *(1 mark*

From OCR Physics A G481 Mechanics mark scheme May 2011 (Question 3c)

i	Magnitude is 120 (N) / equal to weight Direction is (vertically) up / opposite to weight	B1 B1	
ii	Correct diagram  Correct detail on diagram $120^2 = 70^2 + T^2$ $T = 97$ (N) or 97.5 (N)	M1 A1 C1 A1	**Note:** For the M1 mark, the basic diagram must have all sides labelled (70, 120, and T) <u>and</u> the angle between 70 (N) and T is judged by eye to be 90° **Note:** For the A1 mark, all the arrows are marked and cyclic **Note:** For the C1 and A1 marks, $T = \sqrt{120^2 + 70^2} = 140$ scores zero **Allow:** 2 marks for T in the range of 94 (N) to 100 (N) if scale drawing is done

(6) M - Draw vector triangles using real data
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In groups of 2 or 3 set up the practical to **determine the tension in a piece of string**

1. make a suitable table of results, and plot a graph
2. Resolve F to calculate the tension in the string for 3 different values of mass.
3. Complete the question analysis

Kilo 10^3

Mega 10^6

Giga 10^9

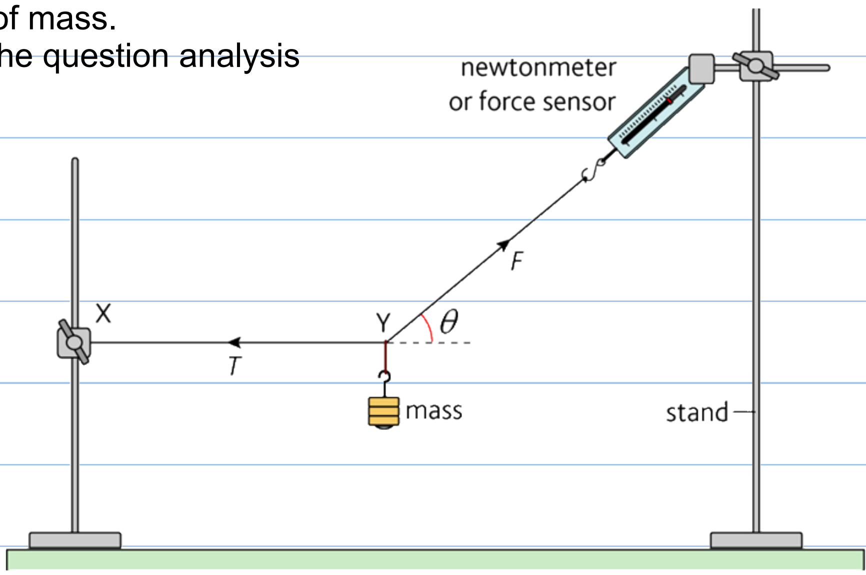

Figure 1 *Experimental set-up*

Questions

1 Choose one pair of results from your experiment and draw a scale diagram of the forces in order to determine the force, *T*, acting horizontally along **XY**. (*3 marks*)

2 Explain how you ensured that the string **XY** was horizontal. You may add to Figure 1 to explain your answer. (*2 marks*)

3 Consider the scale diagram you drew in question **1** and determine the equation of the line of your graph. Show that the gradient of your graph is equal to sin *θ*. (*2 marks*)

4 Suggest how your graph would be affected if **XY** had not been kept horizontal. (*4 marks*)

make table for student of F, m, mg and T.

T can be found by resolving.

Check mg = Fsintheta

T = Fcostheta

(6) M - Draw vector triangles using real data
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Plenary

Answers for method sheet

1 Students should choose a suitable, linear scale, e.g., 1 cm = 1 N. (*1 mark*)

Force, *F*, and weight, *m g*, should be joined nose to tail. (*1 mark*)

The triangle should be completed by the force, *T*, and the students should have a value equal to the length of the line they have drawn. (*1 mark*)

2 Ensure that **XY** is horizontal by taking a vertical measurement from the bench at points **X** and **Y**. (*1 mark*)

Use a set square to ensure that the ruler is vertical (see Figure 1). (*1 mark*)

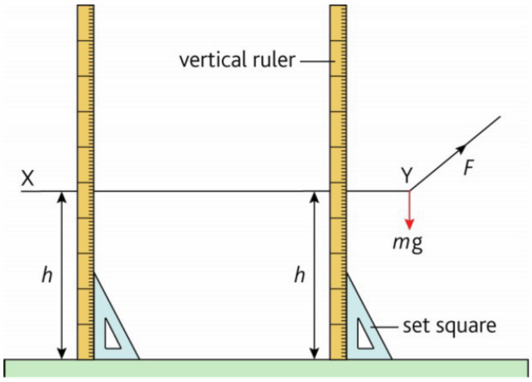

Figure 1 *Ensuring **XY** is horizontal*

3 Drawing a closed triangle of the forces, or resolving the forces into their components, shows that $m g = F \sin \theta$. (*1 mark*)

This is the equation of the graph (in the form $y = m x + c$), where $\sin \theta$ is the gradient. (*1 mark*)

4 If **XY** is horizontal then $m g = F \sin \theta$. (*1 mark*)

Therefore, the graph is a straight line with gradient = $\sin \theta$. (*1 mark*)

If **XY** is not horizontal then there will be a component of tension in the vertical direction and mg will no longer be equal to $F \sin \theta$. (*1 mark*)

Therefore, the graph will not be a straight line. (*1 mark*)